

January 12, 1963

Dear Professor Dicke-

Your recent paper in Science reminds me to ask a question I have had in mind for some time concerning theories of temporal variation of fundamental constants. You remark on the possible change in the gravitational constant. Does the theory, or any related one, posit an analogous change in the electromagnetic force ~~constant~~ constants, particularly in such a fashion that chemical binding energies would have altered? If so, this would of course have ever larger geochemical and geophysical consequences; but it should be pointed out that DNA must have been able to replicate for at least 10^9 years, so we would have to be rather cautious about any process that could greatly alter the energy of the hydrogen bond.

You must have taken up this point elsewhere, but if the Sun was calculably brighter in the past, shouldn't this apply to stars generally; hence, as we presently observe them, the intrinsic brightness of galaxies should increase with their distance which is to say their actual distance is underestimated. I suppose the effect is only about $e^{-0.8}$ in brightness or ~~100%~~ its square root, about 50%, in distance even at t light-years, but such a term deserves mention if its not already implicit in the expression.

Sincerely,

Penner

DICKE

Perhaps through an oversimplification, the last consideration would also give a minimum apparent brightness of distant objects. If the brightness law is $L = e^{-At}$, where t is now age in ratio to the age of the universe, $t \leq 1$; and for the sun, $A = .8$. Then, apparent brightness observed here will be as $e^{-At} \cdot (1-t)^{-2}$; setting the first derivative of this at zero, $t = 1 - A/2$. I.E. the dimmest objects following the laws of your paper are at $t = 0.6$

Please don't waste any time correcting these trivial calculations; I would appreciate your comment on my query on time-invariance of chemistry.